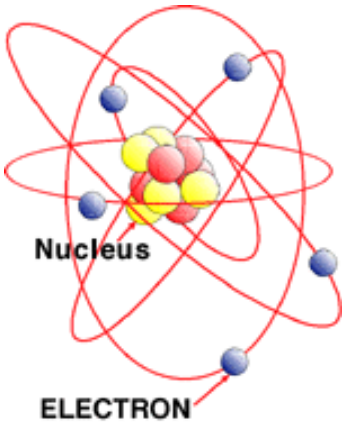
The Energy Story

Chapter 2: What is Electricity?

Electricity powers many of the things in our world. Some things like flashlights and GameBoys use electricity that is stored in batteries as chemical energy. Other things use electricity that comes from an electrical plug in a wall socket.

But that energy from the wall socket comes from someplace else. It comes to your house through electrical wires. How does electrical energy come through a solid wire? The wire is not like an empty garden hose that water flows through. How does it get from power plants to your house?

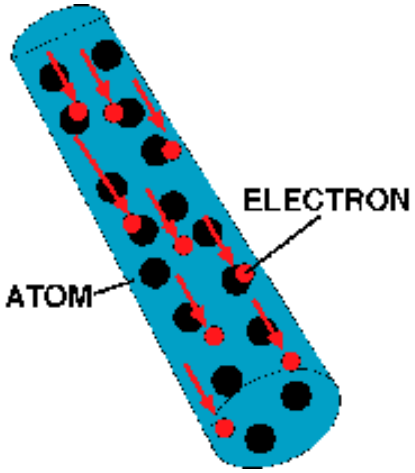
You'll remember in Chapter 1 that energy can be conducted. Heat energy was conducted from the heat through the soup pan to the soup. Electricity is the conduction (or transfer) of energy from one place to another. The electricity is the "flow" of energy.



All matter is made up of atoms, and atoms are made up of smaller particles, one of which is the electron. Electrons spin around the center, or nucleus, of atoms, just like the moon around the earth.

The nucleus is made up of neutrons and protons. Electrons have a charge, a negative charge. Protons have a positive charge and neutrons are neutral or have neither a positive nor a negative charge.

Some kinds of atoms have electrons that are loosely attached. They can easily be made to move from one atom to another. When those electrons move among the atoms of matter, a current of electricity is created.



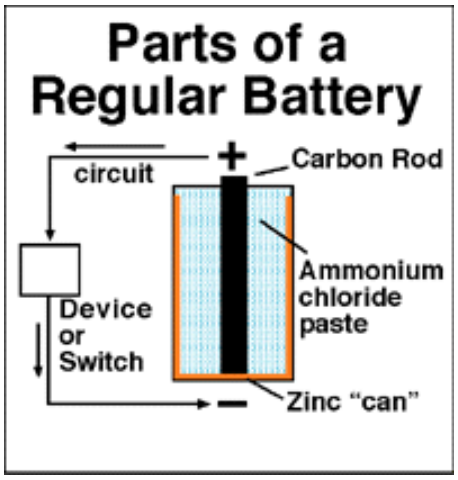
This is what happens in a piece of wire. The electrons are passed from atom to atom, creating an electrical current from one end to the other, just like in the picture to the left.

Electricity flows through some things better than others. How well something conducts electricity is measured by its resistance. Resistance in wire depends on how thick it is, how long it is, and what it's made of. The lower the resistance of a wire, the better it conducts electricity.

Copper is used in many wires because it has a lower resistance than many other metals. The wires in your walls, inside your lamps, and elsewhere are mostly copper.

The electric force that "pushes" electrons is measured in **volts**.

American homes use 110 volts of electric power for regular appliances. Larger appliances, like a clothes dryer or stove, use 220 volts. Some countries use 220 volts for all of their appliances and electric devices.



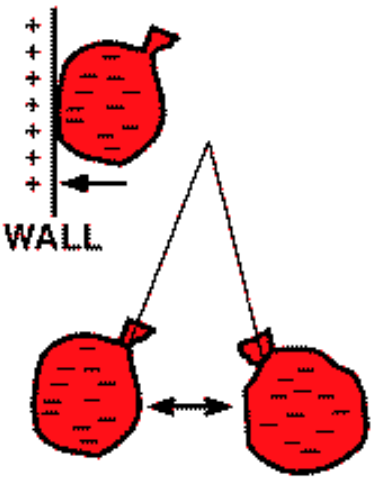
Batteries contain stored chemical energy. When the chemicals react with each other, they produce an electrical charge. This charge changes into electrical energy when the battery is connected in a circuit.

Along the circuit you can have a light bulb and on-off switch. The light bulb changes the electrical energy into light and heat energy.

You can have a heating element. When the electricity flows, the resistance causes friction and the friction causes heat. The higher the resistance, the hotter it can get. So, a coiled wire that is high in resistance, like the wire in a hair dryer, can heat up.

You can also have a motor. A motor works using electromagnetism. It has a coiled up wire that sits between the north and south poles of a magnet. When current flows through the coil, another magnet field is produced. The north pole of the fixed magnet attracts the south pole of the coiled wire. The two north poles push away, or repulse, each other. The motor is set up so that this attraction and repulsion spins the center section with the coiled wire.

One other type of electrical energy is static electricity. Unlike current electricity that moves, static electricity stays in one place.



Try this experiment.

Rub a balloon on a wool sweater or on your hair. Then hold it up to a wall. The balloon will stay there by itself.

Now rub two balloons, hold them by strings at the end and put them next to each other. They'll move apart.

Rubbing the balloons gives them static electricity. When you rub the balloon it picks up extra electrons from the sweater or your hair and becomes slightly negatively charged.

The negative charges in the single balloon are attracted to the positive charges in the wall.

The two balloons hanging by strings both have negative charges. Negative charges always repel negative charges and positive always repels positive charges. So, the two balloons' negative charges "push" each other apart.

Static electricity can also give you a shock. If you walk across a carpet, shuffling your feet and touch something metal, a spark can jump between you and the metal object. Shuffling your feet picks up additional electrons that are spread over your body. When you touch a metal door knob or something with a positive charge the electricity jumps across the small gap from your fingers just before you touch the metal knob. If you walk across a carpet and touch a computer's case, you can damage a computer. So if you walk across a room always touch something else before touching a computer.

One other type of static electricity can be seen during a thunder and lightning storm. Clouds become charged as ice crystals inside the clouds rub up against each other. The clouds get so highly charged that the electrons jump between the cloud and the ground, or to another cloud. This causes a huge spark, called lightning.

Here's What We Learned

1. Electricity is the flow of energy from one place to another.
2. Atoms have electrons circling them. Some are loosely attached. When electrons move among the atoms of matter, a current of electricity is created.
3. Electricity flows through some objects better than others. Copper is a good conductor of electricity.
4. The electric force that "pushes" electrons is measured in volts.
5. Batteries store chemical energy. An electric circuit connects the positive and negative poles of the battery and allows an electrical current to happen.
6. Static electricity doesn't move. It is the energy that can stick a balloon to a wall if you rub the balloon across a sweater. Lightning is another form of static electricity.

Go To Chapter 3: Generators, Turbines and Power Plants

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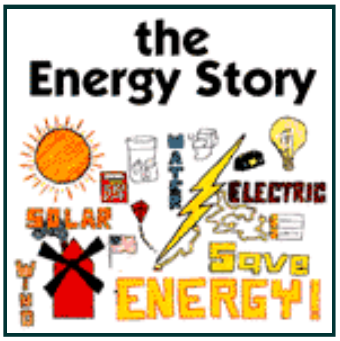

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